5.7 Rational Exponents

- write expressions with rational exponents in radical form and vice versa
- simplify

For all
$b \in R$
$n \in Z$

$$\sqrt[n]{b} = b^{\frac{1}{n}}$$

Exponential Form	Radical Form	
$8^{1/3}$	$\sqrt[3]{8}$	$= 2$
$64^{1/2}$	$\sqrt{64}$	$= 8$
$16^{1/4}$	$\sqrt[4]{16}$	$= 2$
$x^{1/5}$	$\sqrt[5]{x}$	
$x^{3/4}$	$\sqrt[4]{x^3}$	

$$b^{\frac{m}{n}} = \sqrt[n]{b^m}$$

For all $b \in R$ $(b \neq 0)$ and $m, n \in Z$ $(n > 1)$

Simplified
- no negative exponents
- no fractional exponents in denominator
- not a complex fraction → fraction in a fraction ex $\frac{\frac{1}{2}}{4}$
- index is as low as it can be

Simplify.

$12 = 4 \cdot 3 = 2 \cdot 2 \cdot 3$

$$\sqrt[4]{36x^2}$$

$$\sqrt[4]{2^2 3^2 x^2}$$

$$(2^2 3^2 x^2)^{1/4}$$

$$2^{2/4} 3^{2/4} x^{2/4}$$

$$2^{1/2} 3^{1/2} x^{1/2}$$

$$= \sqrt{6x}$$

Simplify.

$\sqrt[8]{16}$

$\sqrt[8]{2^4}$

$2^{4/8}$

$\sqrt{2}$

Simplify.

$\sqrt[15]{32}$

$\sqrt[15]{2^5}$ $\sqrt[3]{2}$

$2^{1/3}$

$\sqrt[3]{2}$

$\sqrt[3]{x^2} \cdot \sqrt{x}$

$x^{\frac{2}{3}} \cdot x^{\frac{1}{2}}$

$x^{\frac{4+3}{6}} = x^{7/6} = x\sqrt[6]{x}$

$\sqrt[6]{x^7}$

$\sqrt[12]{9x^6}$

$\sqrt[12]{3^2x^6} = (3^2x^6)^{1/12}$

$\sqrt[6]{3x^3} \leftarrow 3^{2/12}x^{6/12}$

$3^{1/6}x^{3/6}$

$\dfrac{\sqrt[8]{16}}{\sqrt[6]{2}}$

$\sqrt[8]{2^4}$

$= \dfrac{\sqrt{2}}{\sqrt[6]{2}} = \dfrac{2^{1/2}}{2^{1/6}}$

$2^{\frac{3}{6} - \frac{1}{6}} = 2^{\frac{1}{3}} = \sqrt[3]{2}$

$9^{-\frac{1}{2}} = \dfrac{1}{9^{\frac{1}{2}}} = \dfrac{1}{3}$

$$\frac{3}{y^{\frac{1}{2}}} \cdot \frac{y^{\frac{1}{2}}}{y^{\frac{1}{2}}} = \frac{3\sqrt{y}}{y}$$

$$\frac{3}{\sqrt{y}} \cdot \frac{\sqrt{y}}{\sqrt{y}} = y^1$$

HW
p261
21-61odd